

Director Charles Groat Remarks and Slide Show at the University of Rochester River Campus Library Neilly Series, April 21, 2005.

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"USGS: 125 Years of Science for America"

I welcome the opportunity to talk about the USGS – a science organization with a proud history and bright future.

Background

- About 10,000 people
- Part of the Department of the Interior
- No regulatory or management responsibilities

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125 Years of Science for America

In the 125 years since its creation, the USGS has conducted research monitoring, and mapping programs that have led to a better understanding of resources, natural systems, and Earth processes.

In our anniversary year 2004, we celebrated:

- ◆ the mission that has guided us
- ◆ the people and traditions that have shaped us, and
- ◆ the science and technology that will lead us into the future.

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Continuing the Legacy of Lewis and Clark

200 years ago, the first government survey of the natural resources of the American West was commissioned by President Thomas Jefferson.

Meriwether Lewis and **William Clark** traveled 3,700 miles from the Mississippi River to the Pacific to complete that survey.

The **Lewis and Clark Expedition** was the first of many government surveys of the natural resources of the American West.

Lewis & Clark's "**Corps of Discovery**," authorized by Congress to spend \$2,500, begins tradition of government-sponsored scientific surveys West of Mississippi River, crossing the continent 1804-06.

The expedition's significant findings in natural history were not published for years but its geographic discoveries provided a new cartographic understanding of the **Rocky Mountains** and major rivers of the region and later supported U.S. claims to **Oregon Territory**.

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Western Exploration

Decades later, they were followed by western exploratory surveys led by:

- ♦ **Clarence King**, (USGS' first director) in 1867, 1870-73
- ♦ **Ferdinand Vandeveer Hayden**, participated in other Western Surveys in 1853, 1856, 1857, 1859.

In 1867, Congress authorized the first of a series of western explorations.

- ♦ **George Wheeler**, 1869, 1871
- ♦ **John Wesley Powell**, (USGS' second director), and best known director. 1869 & 1870. I sit at the desk he used.

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Establishment of the USGS

On March 3, 1879, the USGS was created to conduct "the classification of the Public Lands, and examination of the geological structure, mineral resources, and products of the national domain." At that time the Federal Government held title to 1.5 billion acres of land, mostly west of the Mississippi, of which only 200 million had been surveyed.

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Clarence King

Clarence King was appointed the first Director of the new Survey by President Rutherford B. Hayes.

- Under King's direction, the USGS emphasized mining geology. Paleontology and topographic mapping were conducted only as necessary to support the geologic studies.
- When King accepted the directorship, he intended to serve for only a short time, until the Survey was well organized and functioning.
- In March 1881 he submitted his resignation, President James Garfield appointed **John Wesley Powell** as his successor.

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John Wesley Powell

- ◆ Powell was a largely self-taught naturalist
- ◆ At the battle of Shiloh, Powell's right arm was shattered by a musket ball and amputated at the elbow.
- ◆ After the Civil War, civilian scientists began to take a leading role in western exploration. In the spring of 1869 Major Powell planned a daring boat trip down the Colorado. This epic journey down the largely unknown Green and Colorado rivers established Powell as a hero.
- ◆ Powell was a scientific entrepreneur. A hard-headed visionary who saw the application of science and rational planning as necessary for the long-term benefit of the nation and its citizens.
- ◆ During Powell's years, he pressed topographic mapping vigorously and made it independent of geology, recognizing that it provided a base not only for geological mapping but for guiding and planning land use.
- ◆ Powell broadened the work of the USGS, and used the Irrigation Survey authorized by Congress in 1888 to further the topographic mapping program and to investigate surface-water measurements.

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Embudo, New Mexico

- ◆ This Irrigation Survey was authorized to investigate arid regions of the U.S., identify irrigable lands, and select sites for reservoirs.
- ◆ Under Powell, the USGS began hydrologic surveys to plot catchment basins and measure streamflow. Men experienced in stream-gaging methods were scarce. USGS created a training camp at Embudo, New Mexico, to develop standard methods of measuring stream flow and to train the people to do it.
- ◆ The first USGS stream gage at Embudo is still there. Many of the methods they developed are still in use today.
- ◆ Powell's controversial views on water in the West and what was and wasn't appropriate use for much of the land there.
 - 1870's-1880's – new settlements in the West
 - 1886 – Drought
 - 1888 – Congress authorized a survey to investigate the arid regions of the US which could benefit from irrigation, to segregate the irrigable lands, and to select sites for reservoirs for the dual purpose of storage and utilization of water for irrigation and prevention of floods and overflows.

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Spin-offs

From 1902 to 1982 there have been a number of “**Spin-offs**” from the USGS as certain functions took on increased importance.

- ◆ The United States Reclamation Service was created as part of the USGS in 1902 to provide the arid West with the water and energy needed for development. In 1907, this service was spun off from the USGS to become the **Bureau of Reclamation**.
- ◆ In 1907, the public land management responsibilities of the USGS were removed when the classification of the forest reserves were transferred to the newly named **U.S. Forest Service**.
- ◆ USGS testing of mineral fuels and structural materials was transferred to the new **Bureau of Mines** in 1910.
- ◆ In 1946, the **Bureau of Land Management** was established by Congress and President Truman by combining the Grazing Service (which had been part of USGS until 1935), Interior’s General Land Office, and other units.
- ◆ In 1982, the USGS Conservation Division became a separate bureau, **Minerals Management Service**, taking on the management of the mineral resources and revenues from federal waters over the outer continental shelf and federal Indian lands.

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A Complete Science Agency

In 1996, Congress and President Clinton **de-funded the Bureau of Mines**. The minerals information function of the former Bureau of Mines was returned to the USGS.

With the merger of the former **National Biological Service** with USGS that same year, the USGS’s transition into the Nation’s premier natural science agency.

Now, combined with the disciplines of geography, geology, and hydrology we are better able to provide a more comprehensive approach to understanding complex Earth physical and biological systems.

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USGS Tradition: Strong-Discipline Based Capabilities

Strong discipline – based capabilities – our tradition
(Long term nationwide data and information)

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Abandoned Mine Lands

Environmental Threats of Abandoned Mine Lands

- Acid and/or metal-rich drainage
- Contaminated water and sediment
- Chronic and acute toxicological effects on aquatic biota
- Human health effects
- Stream and riparian habitat loss

Focus on:

- Processes underpinning the environmental and engineering challenges that face remediators
- Methods development (risk assessment, impact determination, site characterization)
- Broadly interdisciplinary projects
- Client needs and USGS science goals

USGS AML Interests

- ◆ Metal release, transport, and attenuation
 - ◆ Acid mine drainage (mineralogy, geochemistry)
 - ◆ Geoenvironmental models of ore deposits
 - ◆ Hg biogeochemistry
 - ◆ Diurnal metal cycling in streams
 - ◆ Mine waste characterization toolbox
 - ◆ Natural background

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Coal-bed Methane Production on Public Lands

- Coalbed Methane (CBM) is an economic source of methane that is generated and stored in coal beds.
- It occurs throughout the U.S. (and the world) and can be easily and inexpensively recovered.
- Since the early 1980's production has steadily increased, and today CBM serves as an important clean-burning energy resource
- The USGS has the expertise, and is well positioned to address major CBM issues: resource assessment, ground water quantity and quality, habitat impacts, and surface processes.
- Working with
 - State agencies
 - ◆ EPA
 - ◆ BLM

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Integrated Science Agency

- USGS is now an Integrated Science Agency.
- By working across the boundaries between different disciplines, we have been able to expand our capabilities even further. We are able to optimize resources, share technical expertise, and ensure timely data availability.

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Integrated Science Studies

What is Integrated or Interdisciplinary Science?

- It is the blending of expertise from more than one scientific discipline to answer complicated scientific questions and understand complex natural systems.
- It is based on joint planning and methods that integrate data from different disciplines to make inferences about issues that are too broad to be examined by single disciplines.
- It relies on partnerships of people and organizations – sharing of expertise.

Colorado Front Range

- **Growing Urban Area** – Resource needs and land-use conflicts
- **Mineral and Energy Resources**
 - Oil & gas in Denver Basin, old coal mines
 - Crushed stone and gravel for aggregate
- **Ground Water**

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Invasive Species

The USGS together with the Fish and Wildlife Service, National Park Service, Bureau of Land Management, and Bureau of Reclamation to address issues related to **invasive species**.

- Serious ecological problem facing our Nation
- Invasive species cause huge losses in agriculture, livestock, and fisheries.
- Brown tree snake has overtaken Guam; working to prevent invasion of Hawaii
- Spotted knapweed, native to Eurasia, serious problem on rangelands in western U.S. (Grand Teton)

- Tamarisk dominates the riparian vegetation on the Lower Colorado River
- Biological aspects are clear, but also need to understand geologic, soils, hydrologic, and surface process dimension of invasive species occurrence.

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Fires in the West

Recent **fires in the West** brought together scientists from all our disciplines to study the ecological, hydrological, and erosional aspects of wildfire. Requires scientists from biology, geology, and water...

The **Central Region Integrated Science Partnership** is developing techniques to predict erosion and sedimentation in burned watersheds.

Critical scientific findings for land management agencies such as

- understanding rainfall-runoff relations for burned watersheds
- understanding post-fire erosional styles in different geologic terrains
- ♦ mapping post-wildfire hazards and
- ♦ installing early warning precipitation networks – example: after the Missionary Ridge -- Fire near Durango, CO

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Watershed Approach

Watershed Approach – appropriate framework for many studies

- Provides an opportunity to evaluate a region holistically
- Guides resource allocation by land management agencies
- Gives high priority to actions likely to result in ecosystem improvement
- Encourages cooperation among Federal, State, and local levels
- Potentially reduces the total cost and accelerates progress of remediation
- Enables determination of realistic remediation targets

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Groundwater Resources

Bureau of Reclamation - Water 2025 highlighted western water issues—need to understand the amounts and availability of our water resources in the **Nation's Water Resource Base**.

Importance of Ground Water

- Drinking water for half of U.S. population
- Major source of agricultural water
- Sustains streams, lakes, and wetlands
- Large potential reserve for future use

Ground water is the least understood component of our water resource endowment.

In response to Congressional request to define a program to determine fresh water availability in the U.S., the USGS has proposed a comprehensive approach.

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Natural Hazards Initiative

- USGS has fundamental role in monitoring and research dealing with a variety of catastrophic natural hazards:

- Earthquakes
- Volcanoes
- Landslides
- Floods
- Wildfire
- Hurricanes
- Tsunamis

- Launching a major initiative to improve our understanding of these and our predictive capabilities
- Bring monitoring and research capabilities to bear
- Focus on products and services that save lives and protect property science impact emphasis

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Looking to the Future

- Over 125 years, we have learned that addressing complex natural resource issues requires sound science information. Our Core Values are: **Science Excellence**, **Science Leadership**, and **Science Impact**.
- New emphasis on **Science Impact** -- explicit effort to increase the usefulness and expand the use of USGS science information to inform and support decisions at all levels of society. Demonstrate the value of science. Especially ours – we provide objective, credible science as an organization whose sole business is science. We don't regulate or manage anything.

- Clear message from Administration and from Congress that effective support of decisions by "sound science" is desirable and that mechanisms are needed. We want to make our science as "user friendly" to decision makers as possible.
- ♦ Increase our ability to provide the results of our work to a broad audience in an effective way.
- ♦ Natural Research Council report on future role and mission of USGS characterized us as a "Natural Science and Information Agency." We are expanding our information capabilities.
- ♦ Will continue to evolve our programs to ensure that they are relevant, useful, and objective.

(Last Slide)